O54-2

[WG3] Understanding Acid Sulfate Soils: The Key to Their Proper Management

Formation of Inland Saline Acid Sulfate Soils in the Saloum Region, Senegal

Aidara Lamine Fall[1] and Jean-Pierre Montoroi[2*]

[1] *Department of Geography, University Assane Seck of Ziguinchor, Senegal*
[2] *UMR Bioemco 'Biogeochemistry and Ecology of Inland Environments', IRD Institute of Research for Development, France*
Jean-Pierre.Montoroi@ird.fr

Acid Sulphate Soils (ASS) are formed in coastal environments (Coastal Acid Sulphate Soils, CASS) as well as in continental environments (Inland Acid Sulphate Soils, IASS). Similar biogeochemical processes develop when reduced medium by prolonged waterlogging becomes an oxidizing medium. Among these processes, the oxidation of pyrite generating sulfuric acid dominates. CASS are related to the presence of a mangrove ecosystem and form a physical and chemical ripening due to changes in the hydrological regime. IASS are associated with ancient deposits of organic matter buried in continental deposits and undergoing prolonged oxidation. They are much less common and were mainly described in Australia.

In West Africa, the CASS are widely represented as the mangrove was formerly installed in Holocene fluvial deposits from the estuaries of major rivers: Senegal, Sine Saloum, Casamance rivers in Senegal, Gambia river in Gambia, Geba and Cacheu rivers in Guinea Bissau, Great Scarcies rivers in Sierra Leone. Their natural formation was accelerated in the 1970s due to the drastic drop in precipitation. They are often affected by salinization processes related to seawater intrusion in surface and underground. IASS occur in more continental environment and are generally near coastal rivers.

In Senegal, CASS in the lower valley of the Senegal river are associated with vertisols in the middle valley. However, CASS in the valley of Casamance river are connected to red soils (ferralsols) distributed atop the surrounding plateaus by a system of soil transformation where the iron removal processes along the slopes dominate. The objective of the study is to characterize, in a pedological and mineralogical point of view, the ASS in the valley of Saloum River Valley which lies in an intermediate climate context between that of the Senegal river in the north and that of the Casamance river in the south.

The climate of the Saloum region is sudano-sahelian with an average annual precipitation of 600 mm, a wet season (from June to October), a cold dry season (from October to February), a hot dry season (from February to June) and evapotranspiration potential ranging from 1500 to 2000 mm per year. The study site is located 50 km from the sea, 20 km west of the Kaolack town and near the Saloum river whose salinity is higher than that of seawater. A selected toposequence (14°4’20”N, 16°10’59”W) encompassed three topographic units with different pedoenvironmental conditions: floodplain, low terrace and middle terrace. The elevation was ranging from 20 cm in floodplain to 1.15 m in low terrace and 4.15 m in middle terrace. The methodology used was based on (i) the soil description, according to the World Reference Base, of the toposequence with nine soil profiles, (ii) the physical and chemical characterization of soils (iii) the mineralogical characterization of the solid phase by X-ray diffractometry.

The described soils are distributed along the toposequence as Gleyic Hyposalic Solonchak in floodplain, Haplic Gleysol in low terrace and Endogleyic Arenosol in middle terrace. The middle terrace is characterized by a coarser soil texture (mainly sand) compared to the floodplain and the low terrace. The variations of the groundwater level lead changes in soil colour indicating the presence of redoximorphic features at various depths according to the landscape position. The bulk mineralogy is dominated by quartz. The downstream soils (floodplain and low terrace) highly contain halite. Feldspar was only identified in the floodplain and low terrace profiles. The vicinity to the estuary explains the higher amounts of halite and feldspar, mainly albite ($NaAlSi_3O_8$) in the floodplain soils compared to the low and middle terraces. Pyrite is present in the floodplain while jarosite was detected in the floodplain and low terrace. Hematite is only present in the low terrace, while lepidocrocite occurs in all the profiles. Kaolinite is the dominant clay mineral in the entire toposequence suggesting an eolian origin from regional sources. Smectite is also found in all the soils.

The ASS in the valley of Saloum river are more closely related to IASS than CASS, especially by their more continental geographical position. There is a continuum between the soils of the floodplain and those of the middle terrace. The soils of the middle terrace are formed by aeolian deposits that appear to cover former ASS.

Keywords：*Acid sulphate soil, mineralogy, salinity, mangrove, Saloum, Senegal, West Africa*

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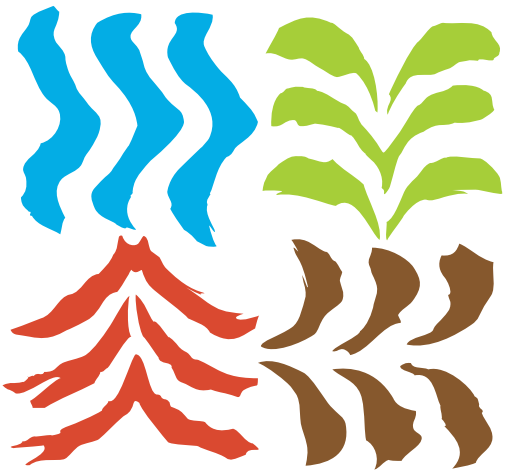

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* Author's Name. 2014. Title of Abstract. Symposium Name. Proceedings of the 20th WCSS (www.20wcss.org), Abstract Online Access System, June 8 to 13, Jeju, Korea.
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O52-1 13:40 **A Heat Pulse Probe Array for Subsurface Soil Evaporation Estimates**
Kashifa Rumana[1], Markus Tuller[2] and Scott Jones[1]
[1]Utah State University Logan, USA; [2]The University of Arizona, USA

O52-2 14:10 **Quantifying Evaporation from a Bare Soil Surface using an Open Top Chamber**
Thomas Baumgartl[1]*, Anne Schneider[2] and Sven Arnold[1]
[1]The University of Queensland, Australia; [2]Palaris, Australia

O52-3 14:30 **Estimation of Soil Evaporation by Aerodynamic-profile Method used with Various α and β Formulations**
Abdulaziz Alharbi, Qassim university, Saudi Arabia

O52-4 14:50 **Predicting Water Retention Curve from Two Point Measurement**
Asim Biswas[1]* and Hamish Cresswell[2]
[1]McGill University, Canada; [2]Commonwealth Scientific and Industrial Research Organisation, Australia

O52-5 15:10 **Partitioning of Evaporation and Transpiration in Arid Shrublands**
Jianting Zhu[1]* and Dongmin Sun[2]
[1]University of Wyoming, USA; [2]University of Houston - Clear Lake, USA

Oral Session No. 53

Halla A (3F)

[C4.4-1] Education and Social Awareness for Soil Science in General Public

June 12 (Thu), 13:40 - 15:30

Convenor: Teruo Higashi (University of Tsukuba, Japan)/ Jin-Ho Lee (Chonbuk National University, Korea)

O53-1 13:40 **Supply and Demand: What Australian Soil Science Students Get and What Australian Employers of Soil Scientists Want**
Damien Field*, Stephen Cattle and Laura Phelps
The University of Sydney, Australia

O53-2 14:10 **Soil and Soil Science Education in the Compulsory and Vocational Education through Korean Textbooks**
Yeong-Sang Jung[1]*, Jin-Ho Joo[1] and Eui-Do Lee[2]
[1]Kangwon National University, Korea; [2]Chuncheon National University of Education, Korea

O53-3 14:30 **Expanding the Horizons of Soil Science to the Public**
David Lindbo[1]* and Jan Hopmans[2]
[1]North Carolina State University and Soil Science Society of America, USA; [2]University of California, Davis and Soil Science Society of America, USA

O53-4 14:50 **Monitoring Soil Science Program for Schools**
Lynette Abbott[1]*, Robert Fitzpatrick[1], Cameron Gardner[2] and Warwick Matthews[2]
[1]The University of Western Australia, Australia; [2]Shenton College, Australia

O53-5 15:10 **A Global Soil Monolith Collection for Education and Advocacy on Soils of the World**
Stephan Mantel
ISRIC World Soil Information, Netherlands

Oral Session No. 54

Halla B (3F)

[WG3] Understanding Acid Sulfate Soils: The Key to Their Proper Management

June 12 (Thu), 13:40 - 15:30

Convenor: Peter Österholm(AboAkademi University , Finland)/ Leigh Sullivan (Southern Cross University, Australia)

O54-1 13:40 **Characteristics of an Abandoned Peat Mining Area Underlain by a Sulfidic Subsoil**
Jaakko Makela and Markku Yli-Halla*
University of Helsinki, Finland

O54-2 14:10 **Formation of Inland Saline Acid Sulfate Soils in the Saloum Region, Senegal**
Aidara Lamine Fall[1] and Jean-Pierre Montoroi[2]*
[1]University Assane Seck of Ziguinchor, Senegal; [2]IRD, France

O54-3 14:30 **Increasing Rice Production on Soils Developed from Pyritized Coastal Sediments in the Malay Peninsula**
Jusop Shamshuddin, Mohd Sufian Kang Enio, Azura Azman Elisa, Alia Jamaludin Farhana, Che Ishak Fauziah and Qurban Ali Panhwar
Universiti Putra Malaysia, Malaysia

O54-4 14:50 **Stable Sulfur Isotopes in Acid Sulfate Soils: Baseline Studies for Se Australia**
Crystal Maher* and Leigh Sullivan
Southern Cross GeoScience, Australia

O54-5 15:10 **Subsurface Chemigation of Acid Sulfate Soils - a New Approach to Mitigate Acid and Metal Leaching**
Sten Engblom[1]*, Pekka Sten[2], Peter Osterholm[3], Rainer Rosendahl[4] and Kjell-Erik Lall[5]
[1]Novia University of Applied Sciences, Finland; [2]Vaasa University of Applied Sciences, Finland; [3]Abo Akademi University, Finland; [4]ProAgria Rural Advisory Centre of Ostrobothnia, Finland; [5]YA! Vocational Education and Training, Finland

Oral Session No. 55

Samda (3F)

[WG10] Cryosols on a Changing Planet: Properties, Processes, Regimes and Functions

June 12 (Thu), 13:40 - 15:30

Convenor: Megan Balks (University of Waikato, New Zealand)/ Hee-Myong Ro (Seoul National University, Korea)

O55-1 13:40 **Hot Issues in Cryosol Research**
Dmitry Konyushkov*
V.V. Dokuchaev Soil Science Institute, Russia

O55-2 14:10 **Characterization, Classification and Distribution of Soils from the South Shetlands Archipelago, Antarctica**
Felipe Nogueira Bello Simas[1]*, Carlos Ernesto Goncalves Reynaud Schaefer[1], Roberto Ferreira Machado Michel[2] and Marcio Rocha Francelino[1]
[1]Universidade Federal de Vicosa, Brazil; [2]Universidade Estadual de Santa Cruz, Brazil